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Most of the techniques that measure college enviromnments are based on student characteristics which are often confused with characteristics of college environments, thus producing many problems for subsequent investigations of college influence. One such technique is the Environmental Assessment Technique (EAT), which describes the environment in terms of 8 characteristics of the student body (size, average intelligence, and 6 "personal orientations) based on the proportion of graduates who majored in each of 6 classes of major fields. To assess graduate school environments, a modified EAT was used which groups graduate faculty and curriculum into 6 classes of major fields and assigns 4 representative disciplines to each type of field. Data were collected from 87 graduate school catalogs for 1968. Curriculum, faculty, and degrees awarded were converted separately to 6 normalized standard scores which comprised a profile for each institution. The profile scores measured the graduate school environment without using student characteristics, and represented fairly stable characteristics of the institution. They were related in plausible ways to other measures of university environment, and were meaningfully related to the quality of graduate education. The modified EAT technique therefore seems to have potential for studying graduate school environments and the impact of graduate schools on their students. (WM)

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Measurement of Graduate School Environment

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For several years, researchers have devoted considerable effort to exploring the ways in which colleges influence their students. As part of this effort, a number of techniques for measuring college environments have been tried, such as the CCI developed by Pace and Stern (1958) and CUES developed by Pace (1963, 1967). Another way to assess the environment is the Environmental Assessment Technique--or EAT--developed by Astin and Holland (1961), which describes the environment in terms of eight characteristics of the student body: its size, average intelligence, and six "personal orientations"--Realistic, Intellectual, Social, Conventional, Enterprising, and Artistic--based on the proportion of graduates who majored in each of six classes of major fields.

Several of these techniques have a common difficulty, namely that they are based on characteristics of students, such as their responses to questionnaires or their choices of major field. Because they confound

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[1] Parts of this study were conducted while Dr. Richards was at the Center for the Study of Evaluation of Instructional Programs, University of California, Los Angeles. Financial support for CSEIP is provided by the U.S. Office of Education.

student characteristics with the characteristics of the college environment, such techniques produce many problems for subsequent investigations of college influence.

In a recent study (Richards and Seligman, 1968), we showed that a modification of EAT, based on grouping the faculty and the curriculum rather than graduates into the six classes of major fields, is a promising technique for measuring undergraduate environments. Moreover, scores for the faculty and the curriculum certainly measure the college environment independent of student characteristics. The present study extends this technique to the assessment of graduate school environments.

Method

The sources of data were the 87 graduate school catalogs for the year of 1968 for those institutions among the 142 in our original study that offer graduate training. (The colleges in the original sample consisted of the 100 colleges used by Pace in his study of norms for CUES and the colleges participating in two longitudinal studies conducted by the American College Testing Program). The graduate schools in this study are a broad, diverse cross-section of American graduate education, including Ivy League institutions, a variety of private universities, land grant universities, schools of technology, and teacher's colleges. The basic procedure was to count the number of graduate courses and of faculty that fell into each of the six classes of major field.

Because the catalogs at some universities are so large, not all courses and faculty members were counted. Rather, four disciplines representative of each class or type were chosen, and we counted only

the number of faculty members and courses for these disciplines. The specific disciplines assigned to each type are shown in Table 1. For the most part, the assignment of disciplines to types is based on Holland's empirical classification of occupations and major fields (1966b). In order to have four fields for each type, it was necessary to use a few fields consistent with Holland's theory but not included in his study. As a check on the variables used in the original version of EAT, we also obtained the number of graduate degrees[2] awarded in the same disciplines in 1966 (U.S. Office of Education, 1967). For comparative purposes, we also classified the undergraduate curriculum at these 87 institutions.

In order to have scores for the curriculum, faculty, and degrees that could be compared at least crudely to each other, we converted each separately to normalized standard scores (Guilford, 1956, pp. 494-501). To compare our results with earlier results for undergraduate environments, we used the conversion tables based on undergraduates. For undergraduate environments, the transformed scores have a mean of 50 and a standard deviation of 10.

The six transformed scores for an individual institution comprise a profile. Like all profiles, it can be analyzed most appropriately in terms of three components: elevation, scatter, and shape (Cronbach & Gleser, 1953). Elevation is simply the mean of the scores comprising the profile. In this study, elevation should reflect mainly the size of the graduate

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[2] However, 9 institutions in the sample granted no graduate degrees in 1966, and were excluded from these analyses.

school. Scatter is proportional to the standard deviation of the profile scores. In this study, graduate schools with high scores have courses and faculty falling predominantly in a few fields, while those with low scores have them distributed fairly evenly across fields. Therefore, scatter is similar to the measure "homogeneity" derived from EAT (Astin & Holland, 1961). Shape is measured by the six profile scores for an institution after these profile scores are equated for college mean and standard deviation. In the present study, therefore, we used eight scores: elevation, scatter, and the six class scores after elevation and scatter were removed by converting scores within colleges to standard scores with a mean of 50 and a standard deviation of 10.

Results and Discussion

The means and standard deviations for the various profile scores are shown in Table 2. Perhaps the most striking thing in this table is the very high score in the Artistic category for the undergraduate curriculum. This suggests that undergraduate education at these universities is still dominated by an emphasis on the liberal arts. This is much less true of the graduate curriculum. The high score in the Social category for the graduate curriculum, no doubt, reflects the fact that some schools of education offer only graduate training. It appears that the character of the faculty is determined more by--or at least is more similar to-- the undergraduate curriculum than by the graduate curriculum, although this may mean only that many universities fail to distinguish between undergraduate and graduate faculties in their catalogs. There is some

indication that even at the graduate level students are more concerned than their universities with occupational training (i.e., graduates have higher scores on Realistic and Conventional). Overall, these results reveal enough variation to suggest that these measures could be used to explore such questions as difference between student and faculty cultures or discrepancies between undergraduate and graduate curricula.

In general, these conclusions are supported by the correlations among corresponding profile scores shown in Table 3. The highest degree of consistency was found, of course, for the various measures of the size of the institution. There was also considerable consistency in the emphasis given to such fields of study as agriculture and engineering (or, in other words, to Realistic fields). For the other characteristics there was only a moderate degree of consistency. Thus, these results also suggest that meaningful investigations could be conducted of differences among various parts of universities.

It is important to know the relationship between these measures of graduate schools and other measures of the environment. Accordingly, Table 4 shows for 66 institutions the correlations between these measures and CUES[3] (Pace 1963, 1967), and Table 5 shows for 86 institutions the correlations between these measures and several environment scores reported by Astin (1965). In general, these correlations are consistent

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[3] We are grateful to Dr. C. Robert Pace for making these scores available to us.

with the construct validity of the graduate school profile scores. Each of the other environmental scores is correlated with several profile scores,[4] and for the most part the pattern of correlation is consistent with the presumed meaning of the scores. (It is somewhat surprising, but not inconsistent, to find that Scholarship and Selectivity are positively related to a scientific-technical emphasis but not to an emphasis on the arts and liberal arts.) The apparent discrepancies between the profile scores and Astin's measures probably result from differences in methodology. We assigned fields of study to only a single class, while in some cases Astin distributed them across classes through differential weighting. Holland's (1966b) later empirical classification suggests that some of Astin's weights may have been inappropriate.

Finally, we computed the correlation between Cartter's (1966) estimates of the quality of graduate education and the profile scores for the graduate curriculum and for the faculty. Score's for quality of graduate education were the average ratings for the fields reported by Cartter in which each institution grants a Ph. D.. Thus, a school granting a Ph. D. in a given field but not listed in Cartter was given the lowest possible rating in that field. We computed quality estimates for fields in each class--Cartter reports data for no fields in the Conventional class--and for overall quality in all fields in which a Ph. D. is offered. Results are presented in Table 6. Because all institutions did not offer Ph. D. 's in all

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[4] It should be recognized, however, that within each profile the scores for the six classes are ipsative and the significance tests are not independent.

fields, the degrees of freedom varied from class to class.

There are a number of significant correlations. Large size is most consistently related to quality of graduate education. Also, high quality seems to be positively associated with a curriculum emphasizing Enterprising fields and negatively associated with an emphasis on Social and Conventional fields. A weighted combination of Elevation and Enterprising emphasis for the graduate curriculum and Scatter and Intellectual emphasis for the faculty yielded a multiple correlation of .68 with the overall quality of the graduate faculty. Thus, our profile scores appear to present in a concise form considerable information about quality of graduate education.

To summarize, our profile scores measure the graduate school environment independent of student characteristics, represent fairly stable characteristics of the institution, are related in plausible ways to other measures of the university environment, and are meaningfully related to quality of graduate education. Moreover, our measures are closely tied to theory (Holland, 1959, 1966a) that yields reasonably unambiguous predictions about person-environment interactions. Therefore, our procedure appears to have considerable promise for the study of graduate school environments and of the impact of graduate schools on their students.

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Table 1

Fields of Study Assigned to Each of the Types

Type	Field
Realistic	Agronomy or forestry Civil engineering Geography Mechanical engineering
Intellectual	Astronomy Chemistry Mathematics Physics
Social	Education Nursing Sociology Theology and religion
Conventional	Accounting Finance Library science Office administration, secretarial science, and business education
Enterprising	Business administration and marketing Economics Management Political science
Artistic	Art and sculpture English Music Philosophy

Table 2

Means and Standard Deviations of Various Profile Scores

		Undergraduate Curriculum	Graduate Curriculum	Faculty	Graduate Degrees
Elevation	$\bar{X}$	52.90	46.30	53.71	46.77
	S.D.	5.50	7.73	6.54	6.13
Scatter	$\bar{X}$	7.78	6.54	6.62	5.57
	S.D.	2.06	2.39	2.11	2.27
Realistic	$\bar{X}$	44.16	45.49	43.83	49.88
	S.D.	7.28	9.15	8.63	10.97
Intellectual	$\bar{X}$	53.79	55.84	56.03	53.50
	S.D.	4.91	6.92	4.74	6.40
Social	$\bar{X}$	49.36	56.67	54.32	55.13
	S.D.	5.46	8.29	7.81	12.04
Conventional	$\bar{X}$	37.57	38.16	36.67	41.64
	S.D.	5.22	7.09	5.80	9.26
Enterprising	$\bar{X}$	50.28	49.33	49.87	49.50
	S.D.	4.18	6.71	4.98	7.46
Artistic	$\bar{X}$	64.80	54.33	59.33	50.63
	S.D.	4.97	7.02	4.63	6.75

Table 3

Correlations Among Corresponding Profile Scores

	Underg. Curr. vs. Grad. Curr.	Underg. Curr. vs. Faculty	Underg. Curr. vs. Grad. Degrees	Grad. Curr. vs. Faculty	Grad. Curr. vs. Grad. Degrees	Faculty vs. Grad. Degrees
Elevation	78**	86**	68**	84**	83**	83**
Scatter	42**	61**	28*	46**	44**	33**
Realistic	78**	88**	75**	81**	79**	73**
Intellectual	43**	57**	45**	45**	45**	42**
Social	47**	71**	28*	60**	54**	47**
Conventional	68**	70**	49**	68**	68**	47**
Enterprising	38**	56**	29**	48**	44**	47**
Artistic	48**	63**	28*	43**	46**	38**

* $p < .05$
** $p < .01$

Note: Decimals have been omitted from all tables showing correlations.

Table 4

Correlations Between Measures of Graduate School Environments and CUES

		Practicality	Community	Awareness	Propriety	Scholarship
Graduate Curriculum	Elevation	19	-54**	27*	-33**	07
	Scatter	-31*	-36**	-11	04	12
	Realistic	-15	-19	-20	-15	38**
	Intellectual	-06	-25*	-12	-33**	28*
	Social	21	12	10	25*	-43**
	Conventional	-01	42**	-16	39**	-09
	Enterprising	-01	-21	20	-24*	10
	Artistic	07	12	23	03	-26**
Faculty	Elevation	27*	-40**	34**	-32**	05
	Scatter	-29*	-13	-16	-01	08
	Realistic	02	-15	-23	-17	31*
	Intellectual	-46**	-16	-10	-15	51**
	Social	16	06	23	18	-33**
	Conventional	02	24*	-12	30*	-19
	Enterprising	-17	-09	15	-21	06
	Artistic	23	11	16	-01	-36**
Graduate Degrees	Elevation	07	-46**	35**	-37**	20
	Scatter	-34**	-25*	-17	08	25*
	Realistic	-19	-32**	-12	-07	44**
	Intellectual	-25*	17	08	-04	33**
	Social	26*	00	-04	05	-42**
	Conventional	20	31*	-19	24*	-23
	Enterprising	-13	-23	17	-36**	06
	Artistic	-04	20	28*	12	-03

* $p < .05$
** $p < .01$

Table 5

Correlations Between Measures of Graduate School Environments and Environmental Measures Reported by Astin

		Astin Measures							
		Selectivity	Size	Realistic	Intellectual	Social	Conventional	Enterprising	Artistic
Graduate Curriculum	Elevation	15	83**	32**	-08	14	46**	12	-16
	Scatter	24*	16	17	27*	-27*	04	03	-22*
	Realistic	34**	12	64**	53**	-63**	-04	-17	-63**
	Intellectual	28**	18	50**	51**	-60**	08	-05	-56**
	Social	-38**	-06	-43**	-47**	52**	16	14	43**
	Conventional	-25*	-48**	-34**	-21*	41**	-31**	-25*	19
	Enterprising	29**	32**	03	08	-28**	28**	38**	03
	Artistic	-28**	-05	-46**	-49**	62**	-12	-02	61**
Faculty	Elevation	13	94**	27*	-15	-05	47**	10	-10
	Scatter	31**	09	-02	07	-10	-17	-03	02
	Realistic	23*	20	75**	50**	-62**	-06	-25*	-67**
	Intellectual	43**	-06	43**	62**	-63**	-17	-04	-50**
	Social	-29**	07	-43**	-51**	66**	12	05	41**
	Conventional	-16	-39**	-32**	-23*	35**	-30**	-29**	29**
	Enterprising	18	05	-19	02	-19	33**	53**	11
	Artistic	-36**	01	-52**	-45**	46**	14	23*	59**
Graduate Degrees	Elevation	28*	84**	25*	-07	-17	39**	12	-08
	Scatter	39**	09	18	13	-18	-20	-11	-14
	Realistic	40**	24*	74**	56**	-70**	-02	-15	-63**
	Intellectual	36**	-13	17	58**	-46**	-11	11	-33**
	Social	-47**	02	-30**	-47**	53**	09	-10	35**
	Conventional	-33**	-35**	-34**	-29**	52**	-26*	-30**	20
	Enterprising	29**	16	-06	09	-33**	28*	45**	00
	Artistic	-02	00	-34**	-35**	29**	05	25*	45**

* $r < .05$
** $r < .01$

Table 6

Correlations Between Measures of Graduate School Environments and Cartter's Estimates of Quality of Graduate Education

	Quality of Graduate Faculty						Effectiveness of Ph. D. Program					
	Rea.	Int.	Soc.	Ent.	Art.	Total	Rea.	Int.	Soc.	Ent.	Art.	Total
Graduate Curriculum:												
Elevation	25	46**	48**	34*	51**	45**	36*	48**	50**	29	47**	46**
Scatter	31	16	11	26	10	16	32	11	09	23	10	12
Realistic	26	13	02	11	10	14	24	12	03	07	12	12
Intellectual	-09	-12	-30*	-28	-23	-13	-19	-13	-28	-27	-20	-15
Social	-34*	-36*	-35*	-28	-31	-36*	-29	34*	-35*	-28	-31	-35*
Conventional	-30	-33*	-32*	-26	-37*	-35*	-25	-37**	-31*	-23	-37*	-36*
Enterprising	39*	41**	50**	36*	41*	43**	36*	39*	46**	31	37*	40**
Artistic	-04	22	35*	22	35*	20	-03	27	35*	28	36*	26
Faculty:												
Elevation	29	47**	49*	35*	35*	44**	41*	48**	44**	24	31	44**
Scatter	38*	30*	30*	20	12	29*	29	27	22	16	12	26
Realistic	15	04	-09	-08	02	04	10	04	-09	-12	02	03
Intellectual	36*	34*	25	29	30	34*	33*	32*	26	22	35*	31*
Social	-15	-06	-02	-04	00	-08	-10	-04	00	01	-04	-05
Conventional	-28	-18	-09	-02	-15	-17	-23	-19	-11	00	-14	-17
Enterprising	21	12	21	19	09	15	11	07	17	20	12	11
Artistic	-23	-24	-13	-23	-27	-23	-17	-21	-13	-19	-26	-21

* $p < .05$
** $p < .01$